

Miniaturized MEMS-Based Gas Chromatograph for High Inertial Loads Associated with Planetary Missions, Phase I

Completed Technology Project (2007 - 2007)



Project Introduction

Thorleaf Research, Inc. proposes to develop a rugged, miniaturized, low power MEMS-based gas chromatograph (GC) capable of handling the high inertial loads encountered during planetary missions. This will provide key enabling technology for mission planners, especially where hard landers or penetrators may be required to meet science objectives within challenging mass, volume and power constraints. Our innovative approach employs high strength inert materials to provide a direct interface between components such as a MEMS-GC injector chip, valves and GC column. This eliminates fittings and tubing connections to greatly enhance robustness, improve system inertness and reduce mass. We believe it will be possible to develop the miniaturized GC system at a mass of about 200 grams, with an average power consumption of less than 50 mW for isothermal operation. Our use of a modular design approach will make it possible to interface the proposed miniaturized GC to miniature mass spectrometers, ion mobility spectrometers, or other detectors of interest to NASA. The goal of our proposed SBIR Phase 1 effort is to demonstrate feasibility for a miniaturized, high inertial load MEMS-based gas chromatograph, and to develop a detailed design for fabricating and demonstrating prototype instrumentation in Phase 2.

Anticipated Benefits

Analysis of commercial instrumentation markets shows that two of the three major growth areas for analytical instrumentation are real-time analysis and environmental monitoring, with projected annual growth rates of more than 15%. Our modular design approach for the miniaturized, low power gas chromatograph designed to resist high inertial loads will help it be adapted for field measurement needs in scientific, energy exploration and environmental monitoring applications where ruggedness and reliability are especially important. Thus, technical developments in the proposed program could have a significant market impact.



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

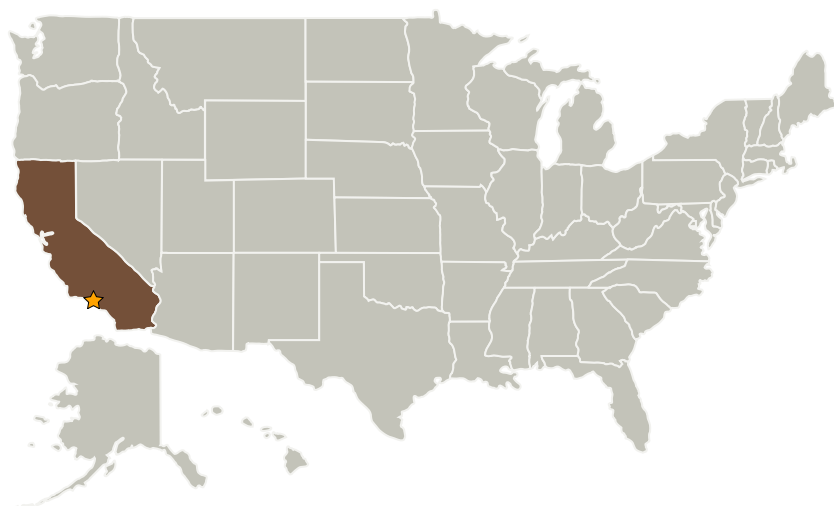
Small Business Innovation Research/Small Business Tech Transfer

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Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Jet Propulsion Laboratory (JPL)	Lead Organization	NASA Center	Pasadena, California
Thorleaf Research, Inc.	Supporting Organization	Industry	Santa Barbara, California

Primary U.S. Work Locations

California

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Project Manager:

Celestino Jun Rosca

Principal Investigator:

Paul Holland

Technology Areas

Primary:

- TX14 Thermal Management Systems
 - └ TX14.1 Cryogenic Systems
 - └ TX14.1.3 Thermal Conditioning for Sensors, Instruments, and High Efficiency Electric Motors